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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/975,297	10/12/2001	Viatcheslav V. Ossipov	10007286-1	1278

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[REDACTED] EXAMINER

SOWARD, IDA M

ART UNIT	PAPER NUMBER
2822	

DATE MAILED: 04/11/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>
	09/975,297	OSSIPOV ET AL.
	<b>Examiner</b> Ida M Soward	<b>Art Unit</b> 2822

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

1) Responsive to communication(s) filed on 12 October 2001.

2a) This action is FINAL.                  2b) This action is non-final.

3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

4) Claim(s) 1-20 is/are pending in the application.

4a) Of the above claim(s) 15-20 is/are withdrawn from consideration.

5) Claim(s) \_\_\_\_\_ is/are allowed.

6) Claim(s) 1-14 is/are rejected.

7) Claim(s) \_\_\_\_\_ is/are objected to.

8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

9) The specification is objected to by the Examiner.

10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) The proposed drawing correction filed on \_\_\_\_\_ is: a) approved b) disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.

12) The oath or declaration is objected to by the Examiner.

#### Priority under 35 U.S.C. §§ 119 and 120

13) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) All b) Some \* c) None of:

1. Certified copies of the priority documents have been received.
2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) The translation of the foreign language provisional application has been received.

15) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

#### Attachment(s)

1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)	4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____
2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)	5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)
3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>3</u> .	6) <input type="checkbox"/> Other: _____

## DETAILED ACTION

This office action is in response to the telephone election on 2/27/02.

### ***Election/Restrictions***

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-14, drawn to an electron emitter, classified in class 257, subclass 10.
- II. Claims 15-20, drawn to a method to fabricate an electron emitter, classified in class 438, subclass 309.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). Unpatentability of the Group I invention would not necessarily imply Unpatentability of the Group II invention, since the device of the Group I invention could be made by a process materially different from those/that of the Group II invention. For examples, sputtering deposition or vacuum evaporation to obtain the same device could have performed forming the metallic layer.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

During a telephone conversation with Trueman H. Denny, III on March 2/27/02 a provisional election was made without traverse to prosecute the invention of an electron emitter, claims 1-14. Affirmation of this election must be made by applicant in replying to this Office action. Claims 15-20 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

***Specification***

The disclosure is objected to because of the following informalities: The serial number should have been included on page 1, line 5.

Appropriate correction is required.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-6 and 14 are rejected under 35 U.S.C. 102(b) as being anticipated by van Gorkom et al. (4,325,084).

van Gorkom et al. teach an electron emitter comprising: a p region **3** formed of a semiconductor material having a hole concentration of  $10^{19}$  cm<sup>-3</sup>; a dielectric layer **6** formed above the p region; an Al metallic layer **8** formed above the dielectric layer; a substrate **2** below the p region; and a p electrode **10** formed above and making electrical contact with the p region (Figures 2-3, cols. 6-7, lines 20-49 and 31-44, respectively).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over van Gorkom et al. (4,325,084) as applied to claim 1 above, and further in view of Koh et al. (US 2002/0033536 A1).

van Gorkom et al. teach all mentioned in the rejection above. However, van Gorkom et al. fail to teach an M electrode above and making contact with a metallic layer. Koh et al. teach an M electrode **11** above and making contact with a metallic layer **10** (Figure 1). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the structure of van Gorkom et al. with the electrode and metallic layer of Koh et al. to eliminate a leakage current path.

Claims 8 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over van Gorkom et al. (4,325,084) as applied to claim 1 above and further in view of Palara (5,665,994).

van Gorkom et al. teach all mentioned in the rejection above. However, van Gorkom et al. fail to teach an n+ region formed above a substrate such that a p region is formed within the n+ region. Palara teaches an n region **12** formed above a substrate **10** such that a p+ region **20** is formed within the n region (Figure 5). Palara further teaches an n electrode **6** formed above and making electrical contact with an n+ region **17** (Figure 5). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the structure of van Gorkom et al. with the p and n regions of Palara to provide a compact integrated device.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gorkom et al. (4,325,084) and Palara (5,665,994) as applied to claim 1 and 8 above, and further in view of Suzuki et al. (5,329,141).

Gorkom et al. and Palara teach all mentioned in the refection above. However, Gorkom et al. and Palara fail to teach an electron concentration level of an n region greater than a hole concentration level in a p region. Suzuki et al. teach an electron concentration level of an n region greater than a hole concentration level in a p region (col. 5, lines 31-35). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the structure of van Gorkom et al. and the p and n regions of Palara with the concentrations of Suzuki et al. to achieve an effective flow of electrons.

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over van Gorkom et al. (4,325,084) and Palara (5,665,994) as applied to claim 1 and 8 above, and further in view of Morishita (5,140,400).

van Gorkom et al. and Palara teach all mentioned in the rejection above. However, van Gorkom et al. and Palara fail to teach an n+ region formed from materials with wider band gap than a p region. Morishita teaches an n+ region formed from materials with wider band gap than a p region (col. 10, lines 16-37). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the structure of van Gorkom et al. and the p and n regions of Palara with the n+ wider band gap of Morishita to prevent undesired diffusion current.

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over van Gorkom et al. (4,325,084) and Palara (5,665,994) as applied to claim 1 above, and further in view of Bronner et al. (US 6,242,770 B1).

van Gorkom et al. and Palara teach all mentioned in the rejection above. However, van Gorkom et al. and Palara fail to teach a p region thickness less than a diffusion length of non-equilibrium electrons in the p region. Bronner et al. teach a p region thickness of 0.05  $\mu\text{m}$  to about 0.2  $\mu\text{m}$ , which is less than a diffusion length of non-equilibrium electrons in the p region (col. 5, lines 5-15). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the structure of van Gorkom et al. and the p and n regions of Palara with the p region thickness of Bronner et al. to occupy a lesser wafer area.

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over van Gorkom et al. (4,325,084) and Palara (5,665,994) as applied to claims 1 and 8 above, and further in view of Ishio et al. (US 200/0014705 A1).

van Gorkom et al. and Palara teach all mentioned in the rejection above. However, van Gorkom et al. and Palara fail to teach a metallic layer thickness on the order of or less than a mean free path for electron energy. Ishio et al. teach a metallic layer thickness of 3nm to 1 $\mu\text{m}$  which is on the order of or less than a mean free path for electron energy [0095]. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the structure of van Gorkom

et al. and the p and n regions of Palara with the metallic layer thickness of Ishio et al. to ensure high connection reliability.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The following patents are cited to further show the state of the art with respects to electron emitters:

Baliga et al. (5,679,966)

Hipwood (4,633,279)

Mishra (5,077,597)

Sasaguri (US 2001/0020733 A1)

Schnitzler (3,845,296)

Shannon et al. (3,931,633)

Shannon et al. (4,516,146)

Strite (5,952,680)

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ida M. Soward whose telephone number is 703-305-3308. The examiner can normally be reached on Monday - Friday, 7:30 am to 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on 703-308-4940. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

ims  
April 5, 2002



Michael Trinh  
Primary Examiner